Lunar International Science Calibration/Coordination Targets*

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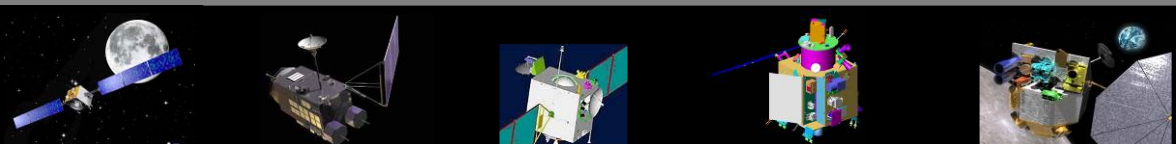
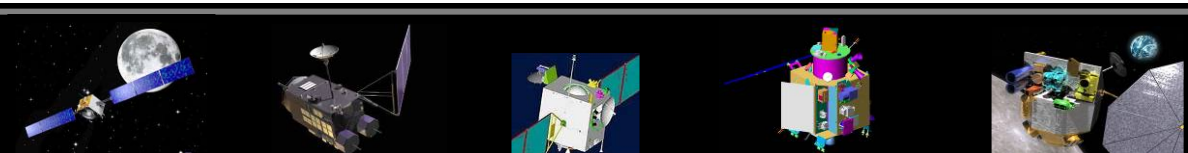
Benefiting from international discussion at COSPAR 2006 and ICEUM8th in Beiijing

*Paper submitted to COSPAR/ICEUM8 proceedings



New Generation of Missions to the Moon

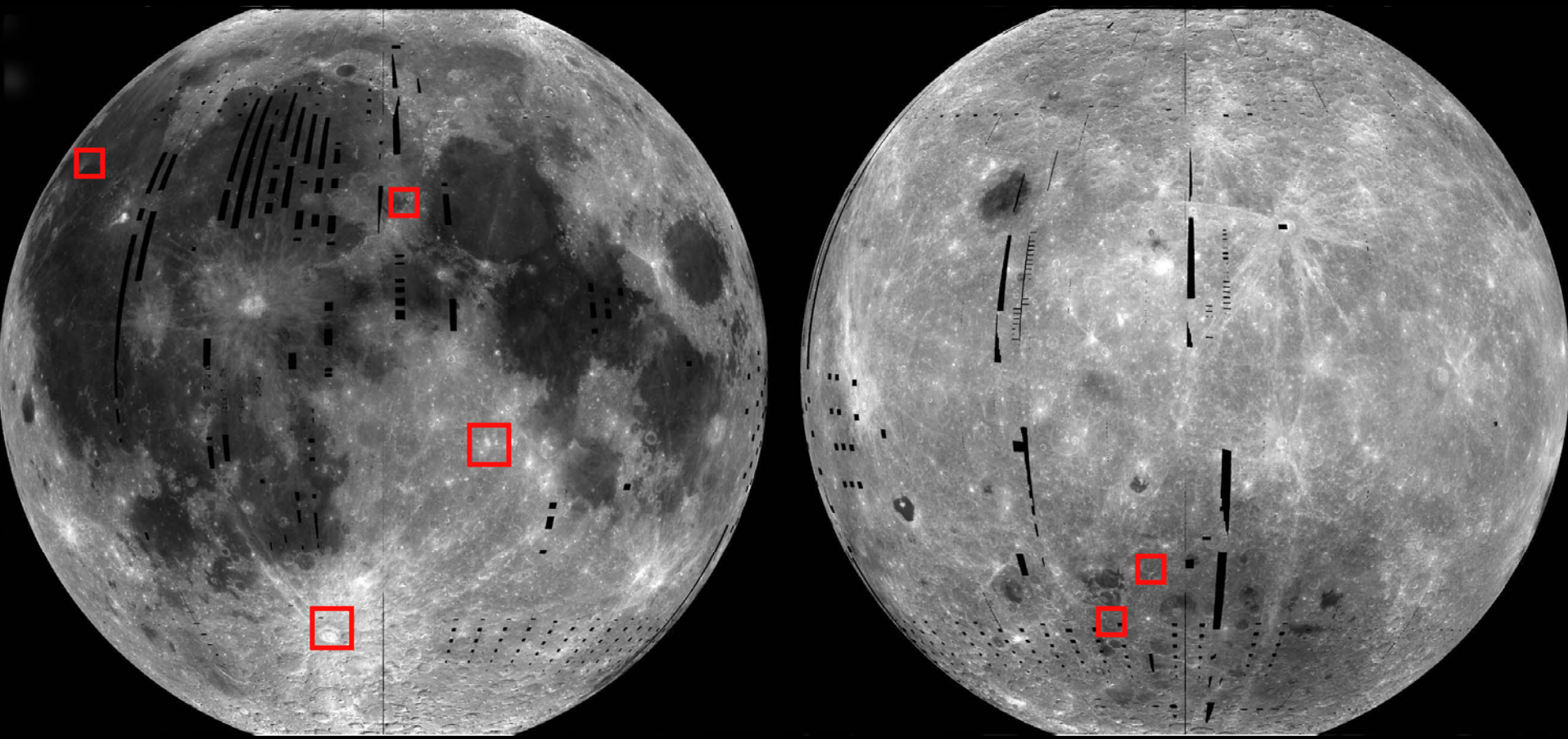
	SMART-1 [ESA]	**SELENE [JAXA]**	**ChangÕE [CNSA]**	**Chandrayaan-1 [ISRO]**	**LRO [NASA]**	**Lunar-A [JAXA]**
Launch	2003	2007	2007	2008	2008	2010?
Orbit	400 x 4000 km polar	100 km polar circular	200 km polar circular	100 km polar circular	50 km polar circular	Elliptical
Objectives	Technology demonstration; investigate poles	Study lunar origin and evolution; develop technology for future lunar exploration	Surface structure, topography, composition; particle environment	Simultaneous composition and terrain mapping; demonstrate impact probe	Improve geodetic net; evaluate polar areas; study radiation environment	Determine the interior structure of the Moon
Payload	AMIE, CIXS, SIR, plasma experiments	TC, MI, SP, relay satellites, X-ray, γ-ray; laser altimeter; radar sounder, magnetometer, plasma imager	4-band micro-wave, IIM, X-ray, γ-ray, WA stereo, energetic ions, laser altimeter	TMC, HySI, LLRI, HEX, Impact probe + *CIXS, SARA, SIR2, miniSAR, M3, RADOM*	LOLA, LROC, LAMP, *LEND*, CRaTER, Radiometer	Penetrators: seismometer, heat flow



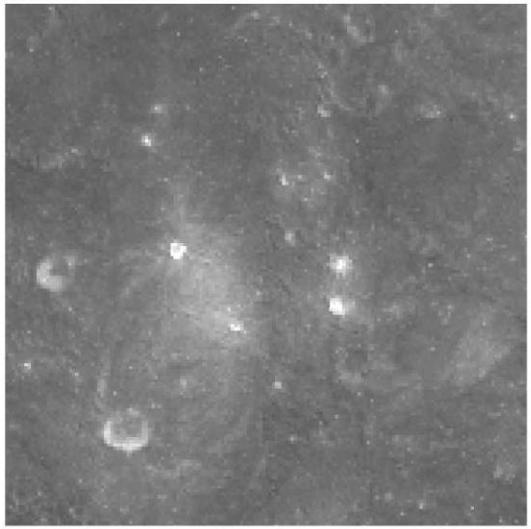
International Opportunities:

- Coordination
  - Optimize independent activities
  - Exchange information for planning
- Collaboration
  - Release data to community
  - Invite participation
- Cooperation
  - Plan joint activities and strategy
  - Exchange experiments and personnel

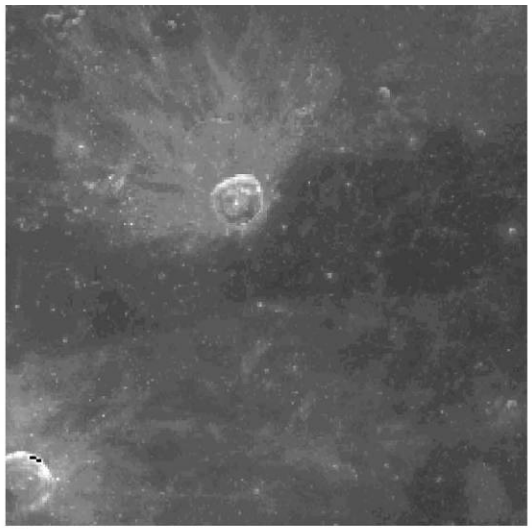
Lunar International Science Coordinated/Calibration Targets (LISCT)



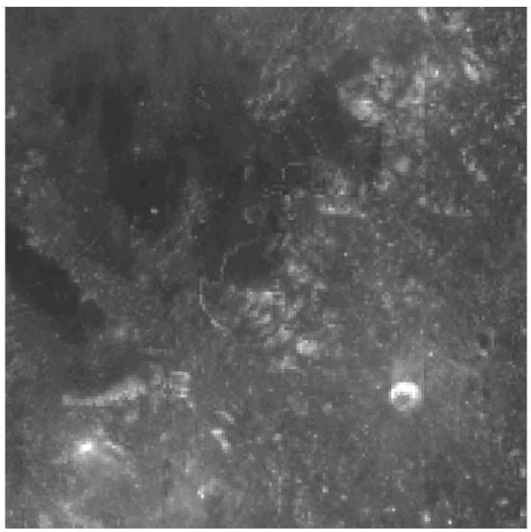
Lunar International Science Coordinated/Calibration Targets (L-ISCT)



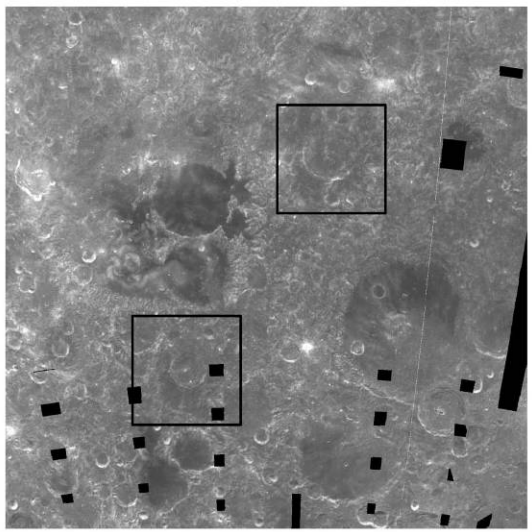
1 Apollo 16: 9.0S; 15.5E



2 Lichtenberg Crater E Rim: 32N; 68W

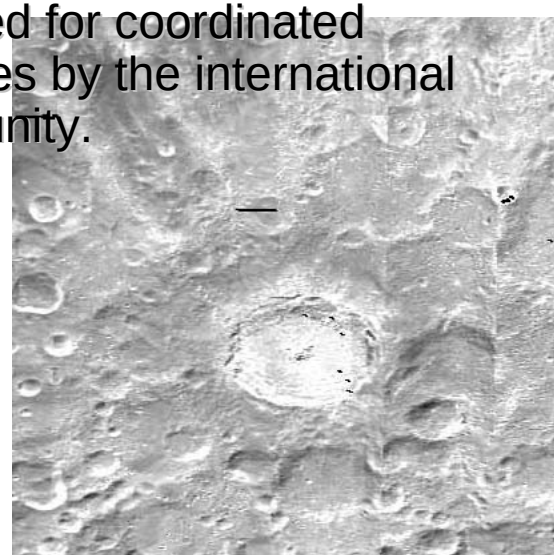


3 Apollo 15: 26.1N; 3.7E



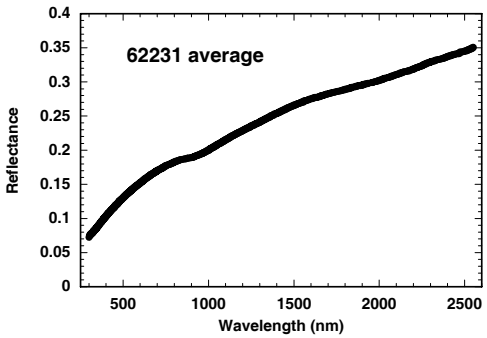
4 NW South Pole-Aitken Basin
30.5S; 175.5E and 41S; 165E

- ***Purpose***: Five specific lunar targets are recommended
  1) for cross-calibration of diverse multi-national instruments and
  2) as the seed for training young scientists with lunar science issues.
- ***Recommended Coordination***: Within the science plan of individual missions, these small targets
  - merit special study
  - by a wide range of sensors.
- For *mutual* benefit, data should pass initial calibration then be released for coordinated analyses by the international community.

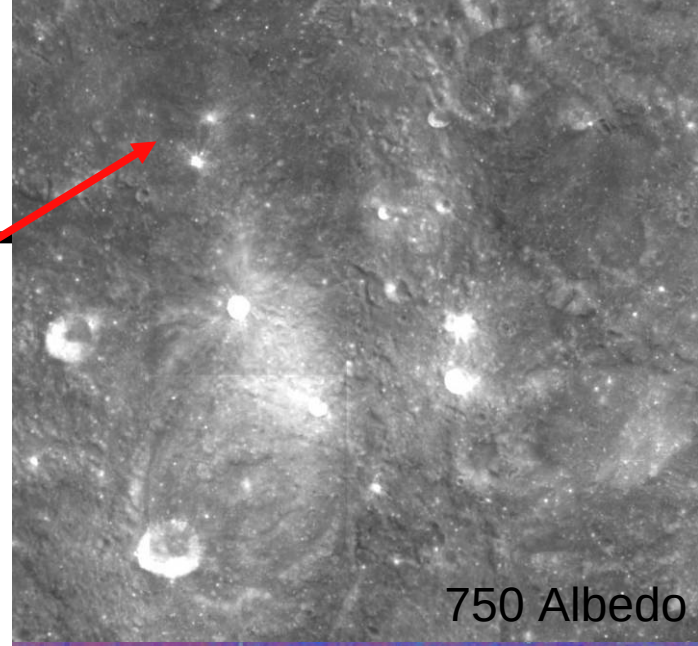


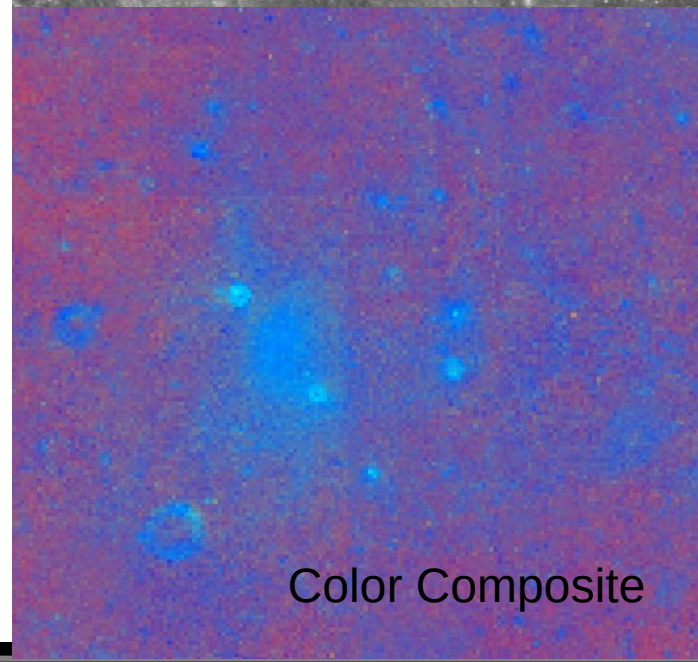
5 Tycho Crater
43.3° S, 11.2° W

#1 Apollo 16



Standard Calibration Area
(mature soil)





Apollo 16: 9.0S; 15.5E

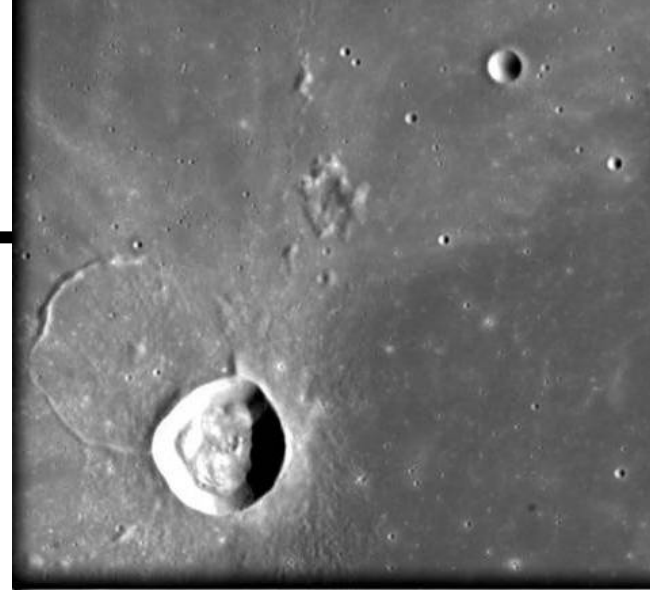
- This site is a large region of relatively uniform feldspathic highlands on the nearside.
- Mature soil and several fresh craters of various sizes are in the region.
- Apollo ground truth provides excellent calibration.
- Is there evidence for multiple units of different basin ejecta?

#2 Lichtenberg

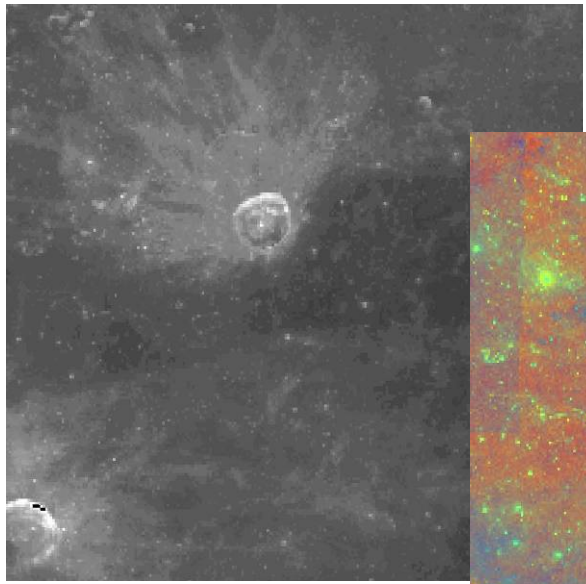
Lichtenberg Crater E Rim: 32N; 68W

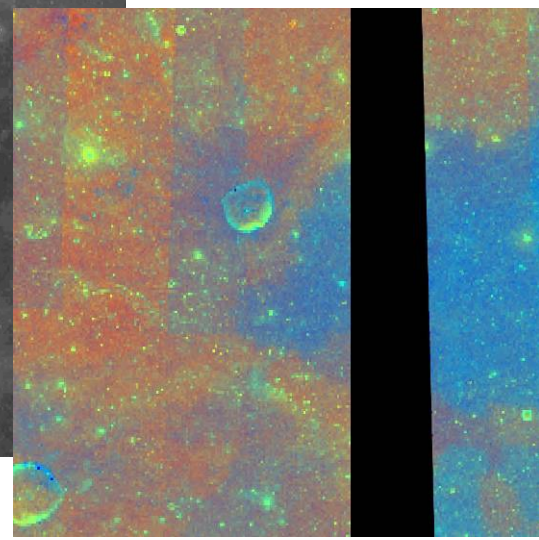
- Some of the youngest high-Ti basalts on the Moon appear to overlay fresh crater deposits.
- Age relations of basalt with the crater Lichtenberg need confirmation.
- Significant contrast with the much *older* eastern high-Ti basalts.

Apollo 15 low sun angle



SMART-1



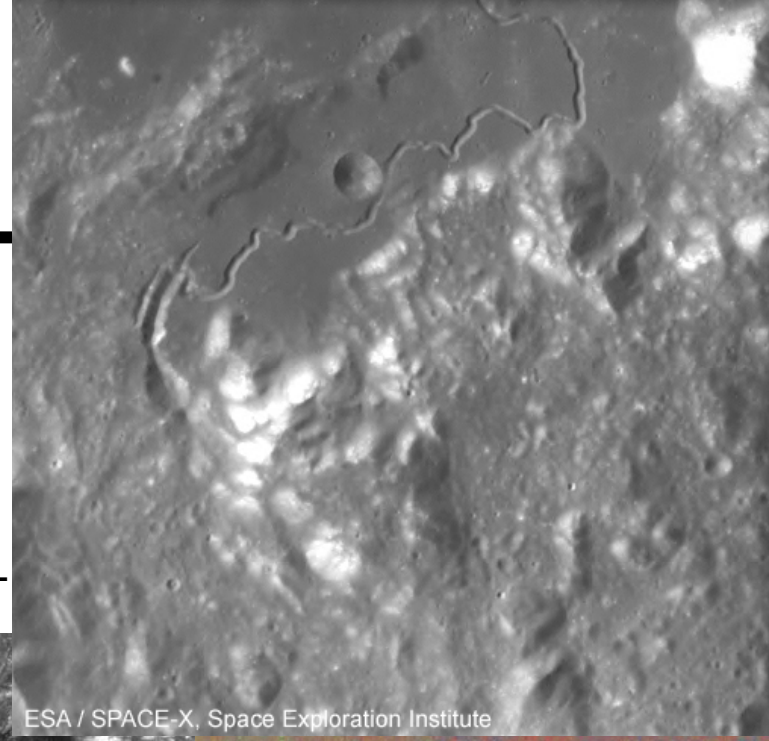


Clementine

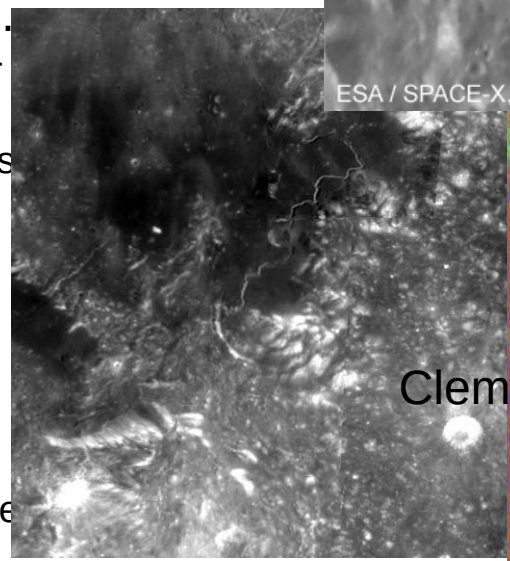
#3 Hadley Rille
Imbrium Rim

Apollo 15: 26.1N; 3.7E

- The evolution of this site on a ring of Imbrium Basin records a diversity of fundamental geologic processes that are poorly understood.
- New remote sensing data can address multiple unresolved issues.
  - What is the nature of the maria and their relation to surrounding units?
  - Where is the lava the formed the sinuous rille?
  - Are there subunits in the Imbrium ejecta deposits? Which are impact melt deposits?
  - What is the distribution of pyroclastic green glass; where is the source area?
  - Is there evidence for stratigraphy and layers in the basin ejecta deposits? in the sinuous rille wall deposits?

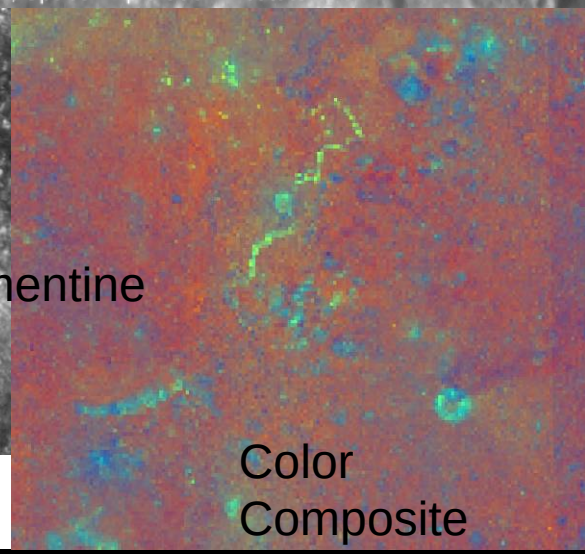


SMART-1



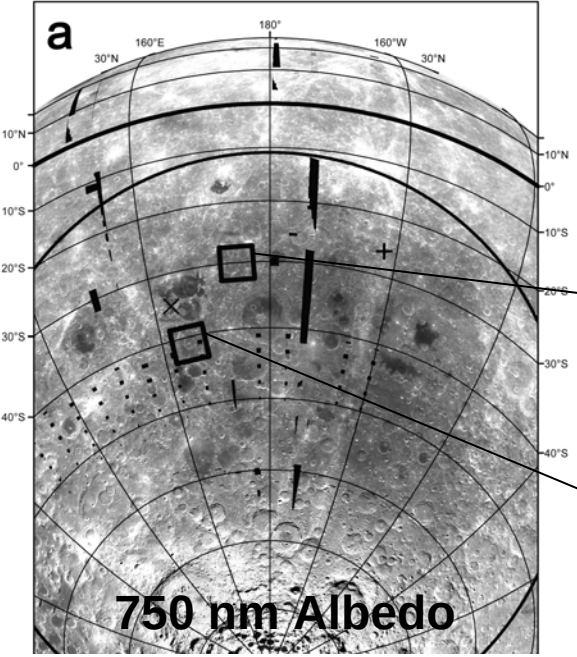
750 nm Albedo

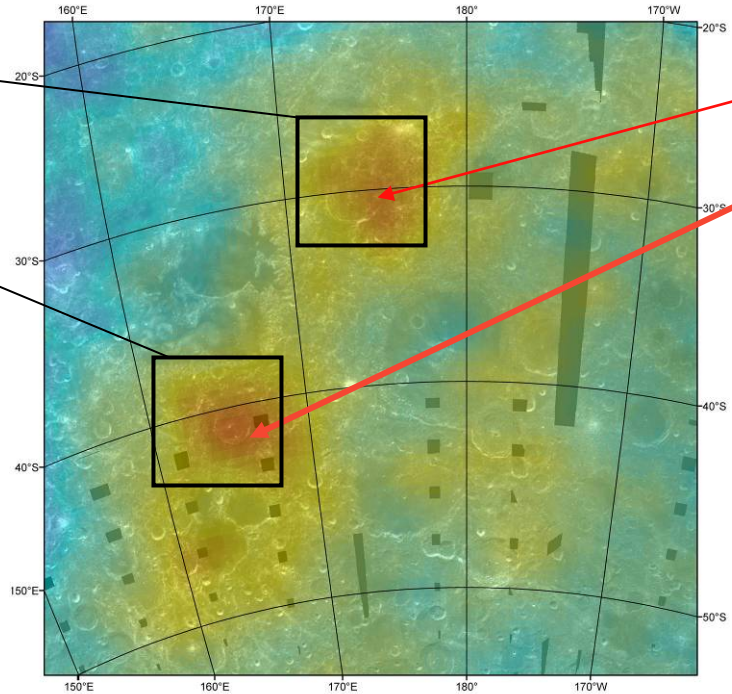
Clementine

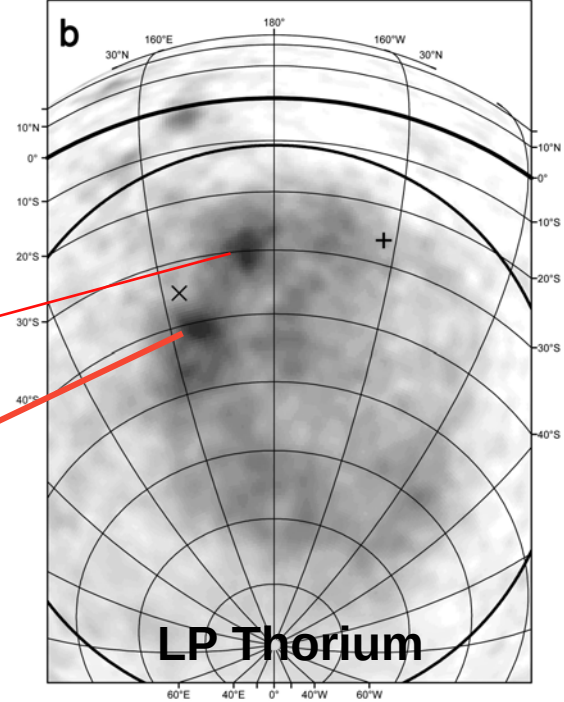


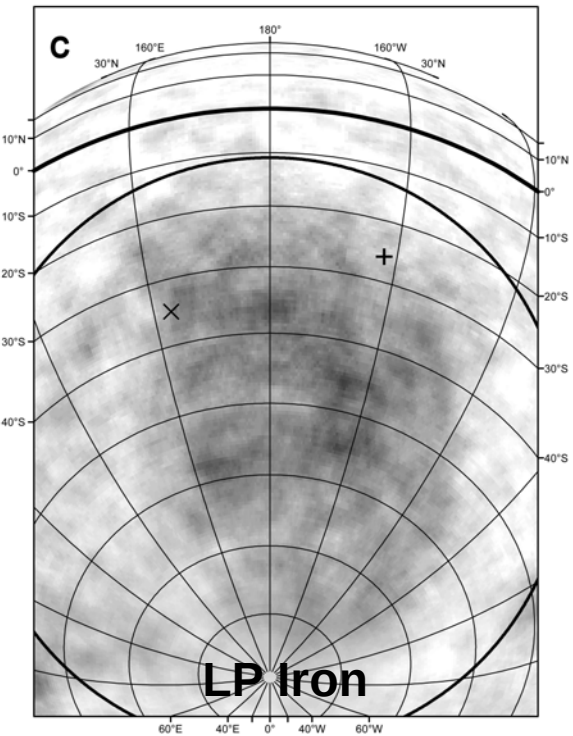
Color Composite

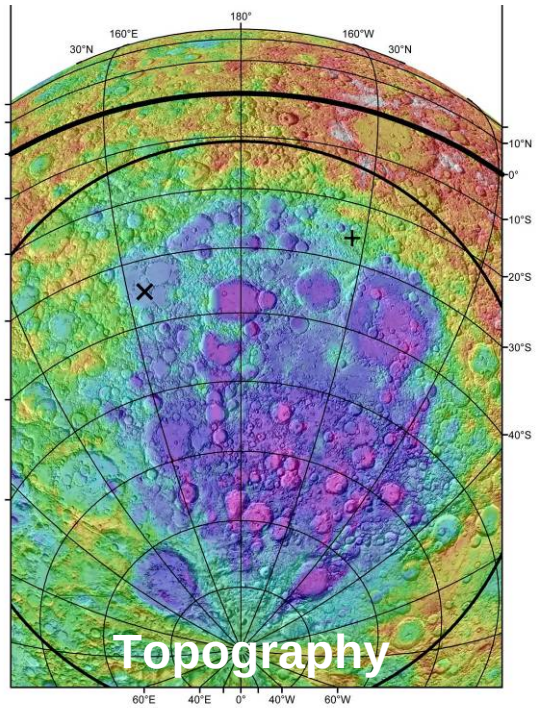
#4 SPA Thorium "Anomaly"









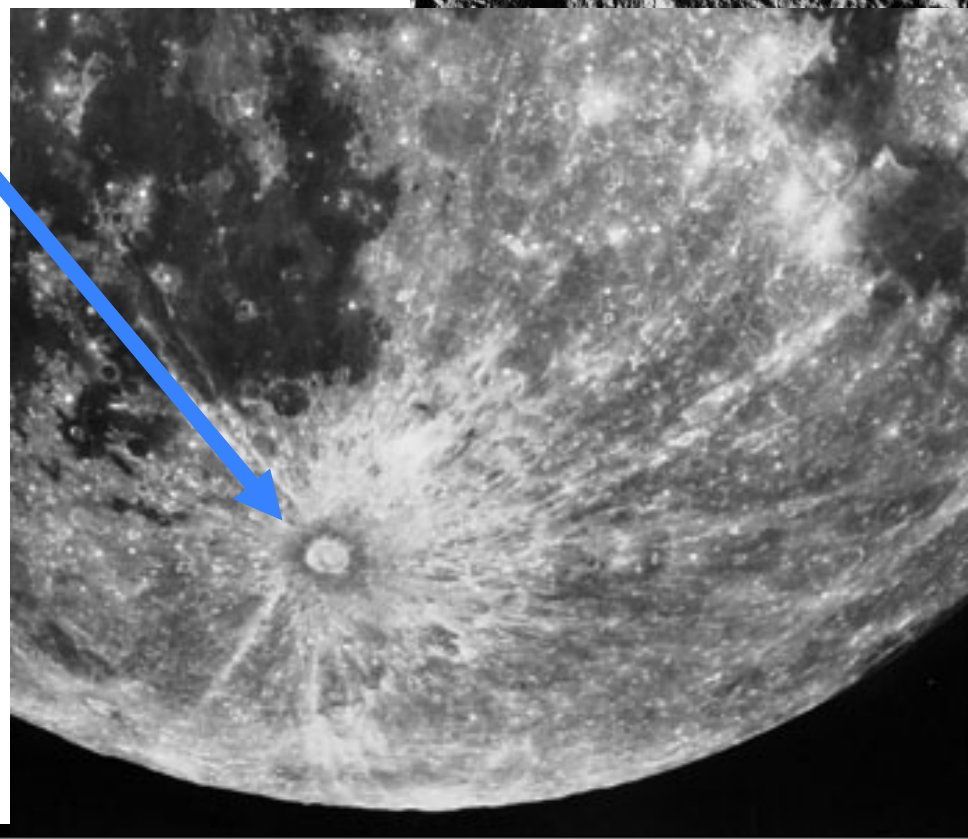


30.5S; 175.5E and 41S; 165E

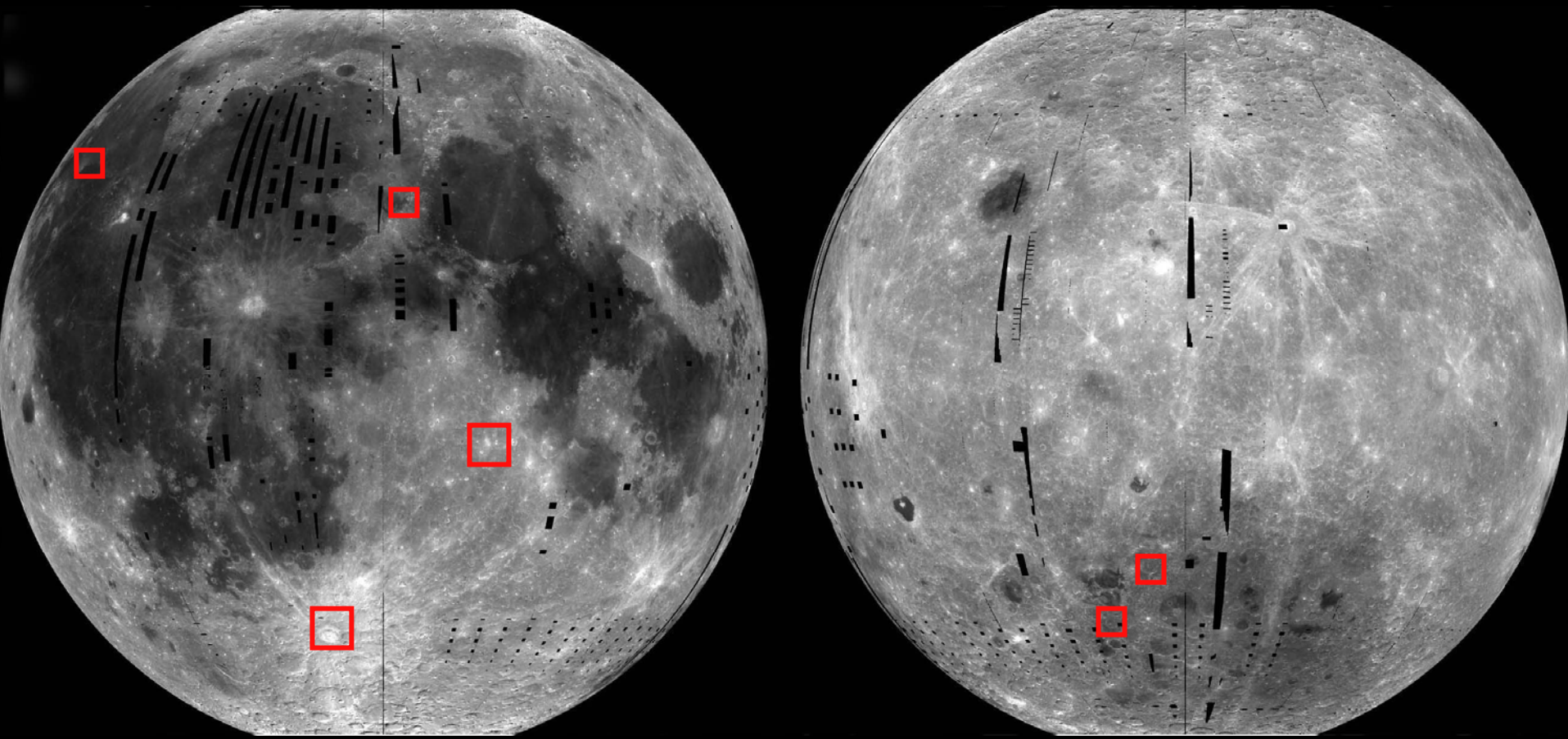
Does this concentration of radiogenic elements result from an asymmetry of excavated SPA lower crust/mantle or is it linked to antipode deposits from Imbrium? Large-scale issues are interwoven.

#5: Tycho Crater

- Tycho is a fresh, bright rayed crater on the nearside.
- It is easily found with binoculars. [Education/Outreach]
- It is scientifically interesting
  - Dark halo impact melt
  - Central peak
  - Prominent mineral absorption bands
  - Highland pluton?



Five Lunar International Science Coordinated/Calibration Targets (LISCT)



Suggested Initial Implementation

1. ***Agreement*** and support is formed among international community of scientists for the LISCT concept.
2. Scientists on each instrument team make these five LISCT targets a ***measurement*** goal.
3. Instrument teams pledge their ***intention to release LISCT data*** (and preliminary calibrations) with initial mission results.
4. Instrument teams (or project) prepare an informal public ***website*** devoted to LISCT data for early release of data.
5. As coordination/calibration progresses, data are improved and revised and ***formally released*** into the public domain (in PDS compatible format on the timescale of individual projects).

Additional suggestions:

6. Team-to-team interaction/discussion is encouraged. Contact information is made available within the projects to allow informal ***direct interactions*** at the discretion of the project.